MITSUBISHI ELECTRIC

Changes for the Better

SPLIT-TYPE, HEAT PUMP AIR CONDITIONERS

July 2007

No. OCH410
REVISED EDITION-A

TECHNICAL & SERVICE MANUAL

CITY MULTI Series Ceiling Cassettes R410A / R22

Indoor unit [model names]

[Service Ref.]

PLFY-P08NCMU-E
PLFY-P08NCMU-E.TH
PLFY-P08NCMU-E$_1$.TH

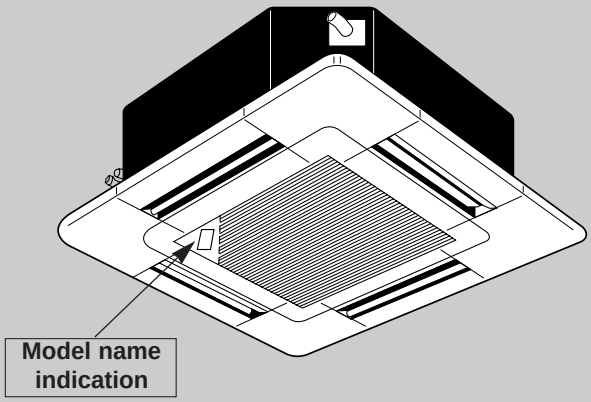
PLFY-P12NCMU-E
PLFY-P12NCMU-E.TH
PLFY-P12NCMU-E$_1$.TH

PLFY-P15NCMU-E
PLFY-P15NCMU-E.TH
PLFY-P15NCMU-E$_1$.TH

Revision:
- PLFY-P08/12/15NCMU-E$_1$.TH are added in REVISED EDITION-A.
- Some descriptions have been modified.

- Please void OCH410.

NOTE:
- This manual describes only service data of the indoor units.



INDOOR UNIT

CONTENTS

1. TECHNICAL CHANGES 2
2. FEATURES 3
3. PART NAMES AND FUNCTIONS 4
4. SPECIFICATIONS 6
5. 4-WAY AIR FLOW SYSTEM 9
6. OUTLINES AND DIMENSIONS 11
7. WIRING DIAGRAM 12
8. REFRIGERANT SYSTEM DIAGRAM 13
9. MICROPROCESSOR CONTROL 14
10. TROUBLESHOOTING 21
11. DISASSEMBLY PROCEDURE 28

PARTS CATALOG (OCB410)

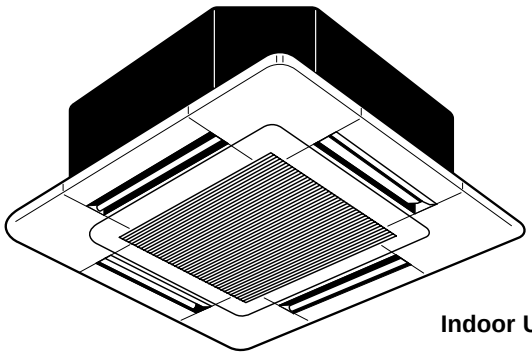
CITY MULTI

1 TECHNICAL CHANGES

PLFY-P08NCMU-E.TH → PLFY-P08NCMU-E$_1$.TH
PLFY-P12NCMU-E.TH → PLFY-P12NCMU-E$_1$.TH
PLFY-P15NCMU-E.TH → PLFY-P15NCMU-E$_1$.TH

• PANEL has been changed.
SLP-15AAU(White : 0.70Y 8.59/0.97) → SLP-15AAUW(Pure white : 6.4Y 8.9/0.4)

2 FEATURES



Indoor Unit

Models	Cooling capacity / Heating capacity
PLFY-P08NCMU-E	8,000 / 9,000 Btu/h
PLFY-P12NCMU-E	12,000 / 13,500 Btu/h
PLFY-P15NCMU-E	15,000 / 17,000 Btu/h

1. PERFECT PANEL SIZE

The brand new 22-7/16 inch PLFY-P08/12/15NCMU-E models are slim, attractive, yet poweful units. PLFY-P08/12/15NCMU-E's size and shape, which perfectly match 2-by-2 ceilings, and its lighter weight of 34 lbs (PLFY-P08NCMU-E) make installation even easier and more convenient.

2. 29 dB WHISPER-QUIET OPERATION (PLFY-P08NCMU-E)

Ideal for cafés, bars, restaurants, and shops. Give all your customers the comfortable environment they deserve.

3. 2,500 HOUR LONG LIFE FILTER

Greatly reduces the frequency the filter needs to be replaced, making maintenance all the easier.

4. FRESH AIR INTAKE

Provides indoor air of the highest quality.

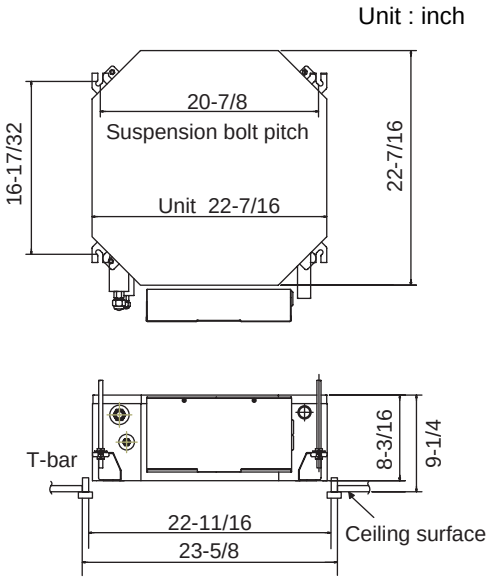
5. SMUDGE-FREE AIRFLOW

Reduces annoying drafts and smudging.

6. SLIM UNIT BODY FOR EASY INSTALLATION

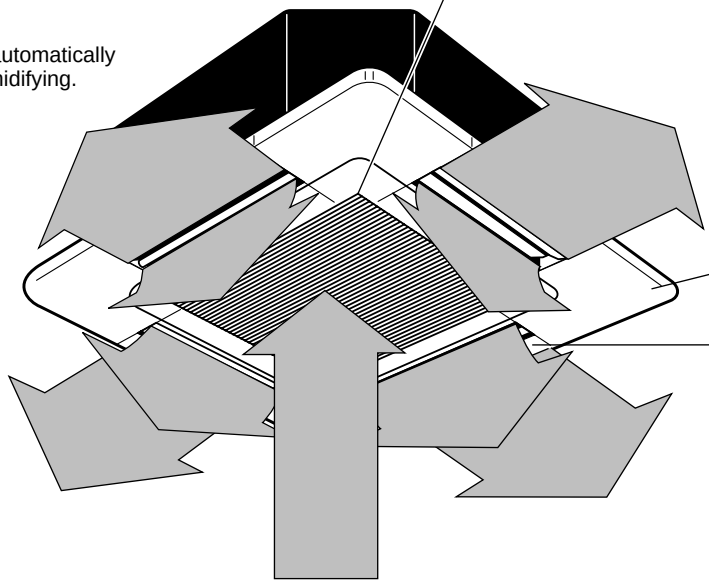
The 22-7/16 inch slim body and octagonal shape, which make the distance between bolts only 16-17/32 inch, help installation easy and maintenance trouble-free.

Unit : inch



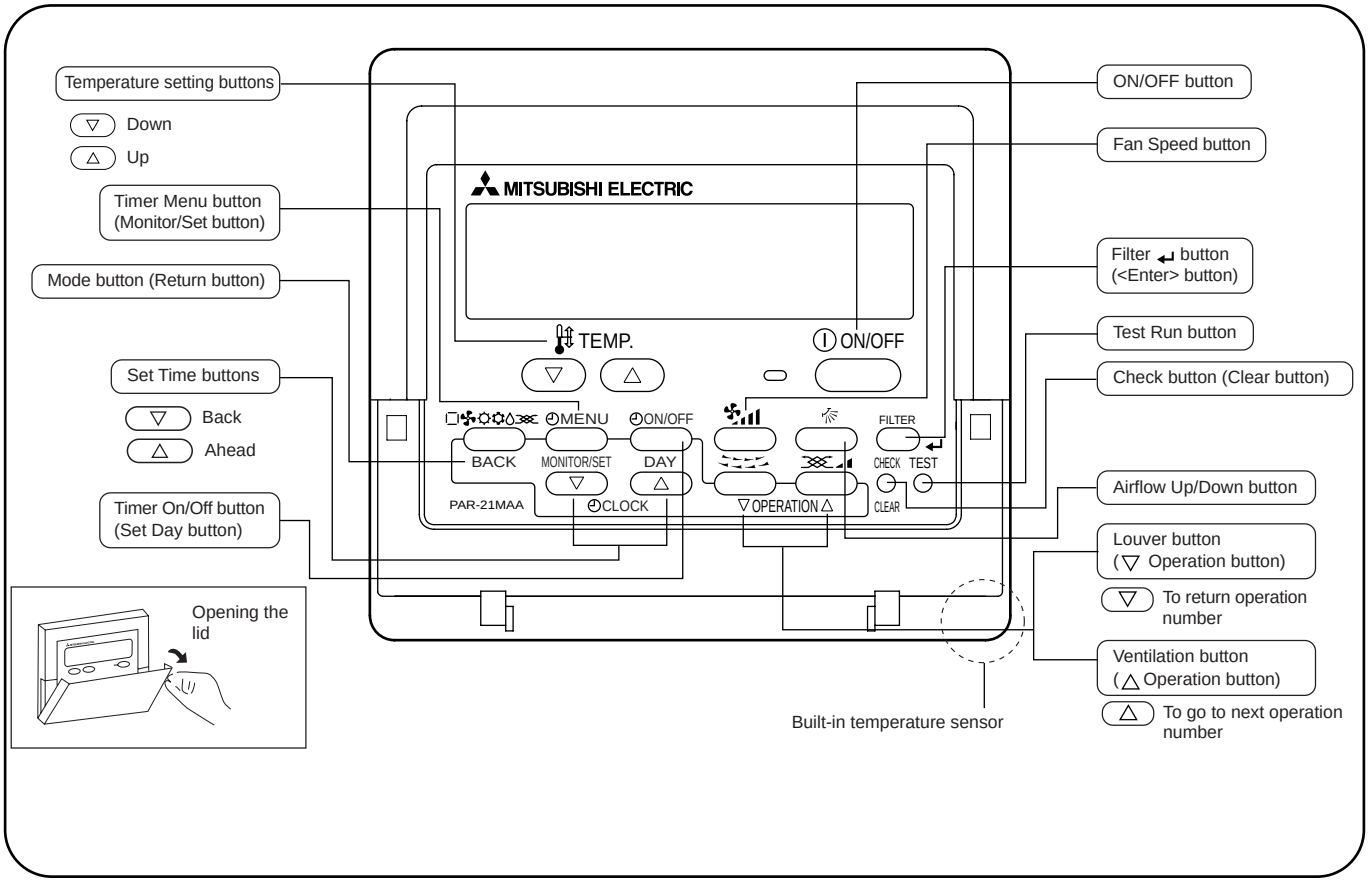
3 PART NAMES AND FUNCTIONS

● Indoor (Main) Unit


Filter
Removes dust and pollutants from return air.
Horizontal Air Outlet
Sets horizontal airflow automatically during cooling or dehumidifying.
Grille
Auto Air Swing Vane
Disperses airflow up and down and adjusts the angle of airflow direction.
Air Intake
Returns air from room.

● Wired remote controller

Once the controllers are set, the same operation mode can be repeated by simply pressing the ON/OFF button.



● Wired remote controller

Display Section

For purposes of this explanation, all parts of the display are shown as lit. During actual operation, only the relevant items will be lit.

Day-of-Week
Shows the current day of the week.

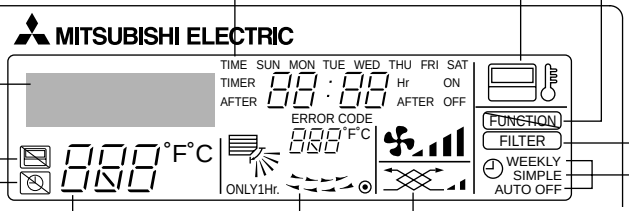
Time/Timer Display
Shows the current time, unless the simple or Auto Off timer is set.
If the simple or Auto Off timer is set, the time to be switched off is shown.

Identifies the current operation
Shows the operating mode, etc.
*Multilanguage display is available.

"Centrally Controlled" indicator
Indicates that operation from the remote controller has been prohibited by a master controller.

"Timer is Off" indicator
Indicates that the timer is off.

Temperature Setting
Shows the target temperature.



Up/Down Air Direction indicator
Shows the direction of the outcoming airflow.

"One Hour Only" indicator
Displayed if the airflow is set to low or downward during COOL or DRY mode. (Operation varies according to model.)
The indicator goes off in one hour, when the airflow direction also changes.

Room Temperature display
Shows the room temperature. The room temperature display range is 46~102°F. The display blinks if the temperature is less than 46°F or 102°F or more.

Louver display
Indicates the action of the swing louver. Does not appear if the louver is not running.

◉ (Power On indicator)
Indicates that the power is on.

"Sensor" indication
Displayed when the remote controller sensor is used.

"Locked" indicator
Indicates that remote controller buttons have been locked.

"Clean The Filter" indicator
To be displayed on when it is time to clean the filter.

Timer indicators
The indicator comes on if the corresponding timer is set.

Fan Speed indicator
Shows the selected fan speed.

Ventilation indicator
Appears when the unit is running in Ventilation mode.

Note:
- "PLEASE WAIT" message
  This message is displayed for approximately 3 minutes when power is supplied to the indoor unit or when the unit is recovering from a power failure.
- "NOT AVAILABLE" message
  This message is displayed if an invalid button is pressed (to operate a function that the indoor unit does not have).
  If a single remote controller is used to operate multiple indoor units simultaneously that are different types, this message will not be displayed as far as any of the indoor units is equipped with the function.

4 SPECIFICATIONS

4-1. SPECIFICATIONS

Item				PLFY-P08NCMU-E.TH PLFY-P08NCMU-E1.TH	PLFY-P12NCMU-E.TH PLFY-P12NCMU-E1.TH	PLFY-P15NCMU-E.TH PLFY-P15NCMU-E1.TH
Power			V·Hz	Single phase 208/230V 60Hz		
Cooling capacity			Btu/h	8,000	12,000	15,000
Heating capacity			Btu/h	9,000	13,500	17,000
Electric characteristic	Input	Cooling	kW	0.05	0.06	0.06
		Heating	kW	0.05	0.06	0.06
	Current	Cooling	A	0.23	0.28	0.28
		Heating	A	0.23	0.28	0.28
Exterior (munsell symbol)			—	Unit : Galvanized sheets with gray heat insulation Grilles : ABS resin Munsell<0.7Y 8.59/0.97>(PLFY-P·NCMU-E.TH) / <6.4Y 8.9/0.4>(PLFY-P·NCMU-E1.TH)		
Dimensions		Height	in	8-3/16<25/32>		
		Width	in	22-7/16<25-19/32>		
		Depth	in	22-7/16<25-19/32>		
Heat exchanger			—	Cross fin		
Fan	Fan × No		—	Turbo fan × 1		
	Air flow ※3	DRY	CFM	280-320-350	320-350-390	
		WET	CFM	250-290-320	290-320-350	
	External static pressure		Pa	0		
	Fan motor output		kW	0.015	0.020	
Insulator			—	Polyethylene sheet		
Air filter			—	PP honey comb fabric		
Pipe dimensions		Gas side	in	1/2"		
		Liquid side	in	1/4"		
Field drain pipe size			in	O.D1-14"		
Noise level ※3			dB	29-32-38	30-34-39	31-35-40
Product weight			lb	34<7>	37<7>	

Note 1. Rating conditions
- Cooling : Indoor : D.B. 80°F W.B. 67°F
- outdoor : D.B. 95°F W.B. 75°F
- Heating : Indoor : D.B. 70°F
- outdoor : D.B. 47°F W.B. 43°F

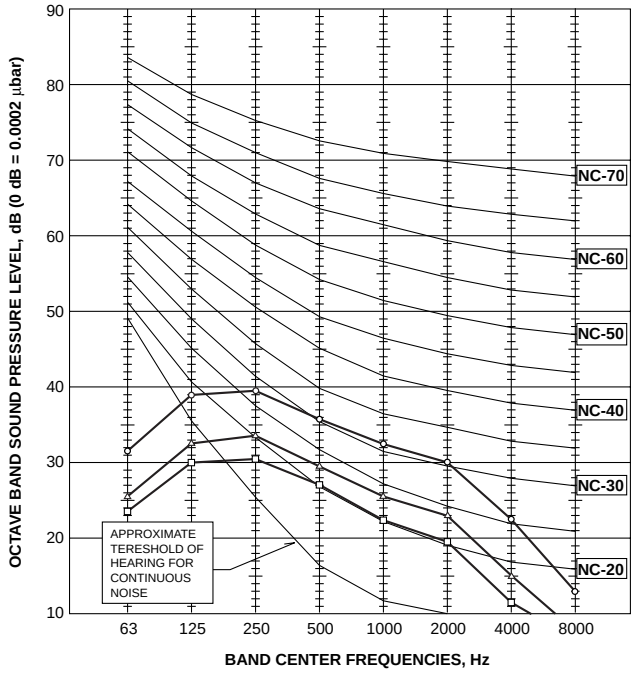
Note 2. The number indicated in < > is for the grille.

※ 3. Air flow and the noise level are indicated as Low - Medium - High.

4-2. NOISE CRITERION CURVES

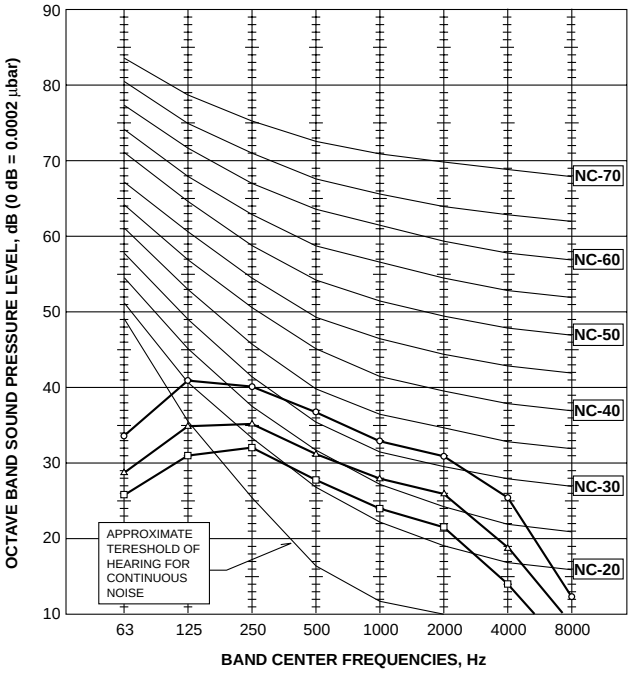
PLFY-P08NCMU-E.TH
PLFY-P08NCMU-E$_1$.TH

NOTCH	SPL(dB)	LINE
High	38	○—○
Medium	32	△—△
Low	29	□—□



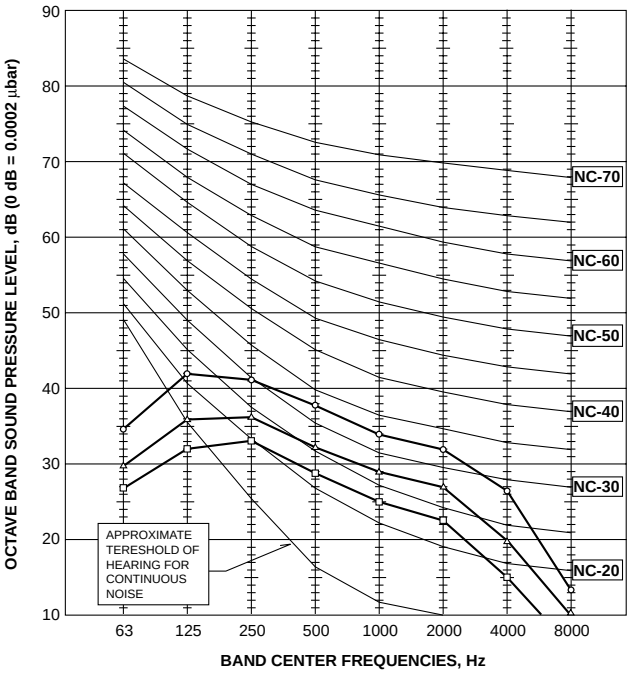
PLFY-P12NCMU-E.TH
PLFY-P12NCMU-E$_1$.TH

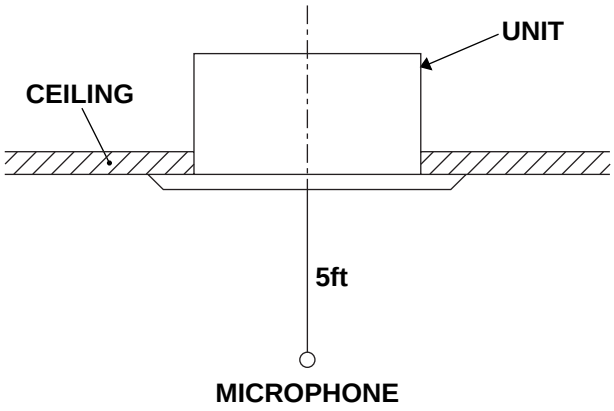
NOTCH	SPL(dB)	LINE
High	39	○—○
Medium	34	△—△
Low	30	□—□



PLFY-P15NCMU-E.TH
PLFY-P15NCMU-E$_1$.TH

NOTCH	SPL(dB)	LINE
High	40	○—○
Medium	35	△—△
Low	31	□—□





NOTE: The sound level is measured in an anechoic room where echoes are few, when compressor stops. The sound may be bigger than the indicated level in actual use due to surrounding echoes. The sound level can be higher by about 2 dB than the indicated level during cooling and heating operation.

4-3. ELECTRICAL PARTS SPECIFICATIONS

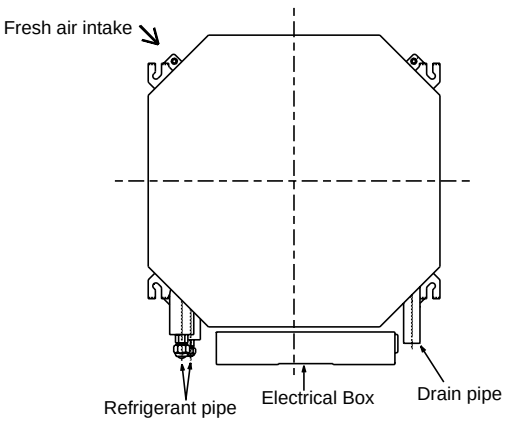
Model / Parts name	Symbol	PLFY-P08NCMU-E.TH PLFY-P08NCMU-E1.TH	PLFY-P12NCMU-E.TH PLFY-P12NCMU-E1.TH	PLFY-P15NCMU-E.TH PLFY-P15NCMU-E1.TH
Thermistor (Room temperature detection)	TH21	Resistance 30°F/15.8kΩ, 50°F/9.6kΩ, 70°F/6.0kΩ, 80°F/4.8kΩ, 90°F/3.9kΩ, 100°F/3.2kΩ		
Thermistor (Pipe temperature detection/ Liquid)	TH22	Resistance 30°F/15.8kΩ, 50°F/9.6kΩ, 70°F/6.0kΩ, 80°F/4.8kΩ, 90°F/3.9kΩ, 100°F/3.2kΩ		
Thermistor (Pipe temperature detection/ Gas)	TH23	Resistance 30°F/15.8kΩ, 50°F/9.6kΩ, 70°F/6.0kΩ, 80°F/4.8kΩ, 90°F/3.9kΩ, 100°F/3.2kΩ		
Fuse (Indoor controller board)	FUSE	250V 6.3A		
Fan motor (with Thermal fuse)	MF	6-pole OUTPUT 15W PK6N15-LA	6-pole OUTPUT 20W PK6N20-LA	6-pole OUTPUT 20W PK6N21-LA
		Thermal fuse OFF 284°F ± 36°F		
Fan motor capacitor	C1	1.5μF × 440V		
Vane motor	MV	MSBPC20M13 DC12V 300Ω/phase		
Drain pump	DP	PLD-12230ME-1 INPUT 12/10.8W 24 ℓ /Hr		
Drain sensor	DS	Thermistor resistance 30°F/6.3kΩ, 50°F/3.9kΩ, 70°F/2.5kΩ, 80°F/2.0kΩ, 90°F/1.6kΩ, 100°F/1.3kΩ		
Linear expansion valve [coil]	LEV	DC12V Stepping motor drive, Port dimension φ3.2 (0~2000pulse) EDM-40YGME		
Electric heater (Condensation proof)	H2	240V 15W		
Power supply terminal block	TB2	(L1, L2,GR) Rated to 330V 30A ※		
Transmission terminal block	TB5	(M1, M2, S) Rated to 250V 20A ※		
MA remote controller terminal block	TB15	(1, 2) Rated to 250V 10A ※		

※ Note: Refer to WIRING DIAGRAM for the supplied voltage.

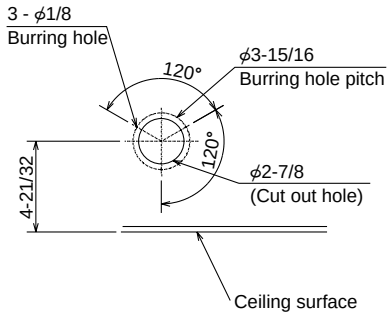
5 4-WAY AIR FLOW SYSTEM

5-1. FRESH AIR INTAKE (Location for installation)

At the time of installation, use the duct holes (cut out) located at the positions shown in following diagram, as and when required.



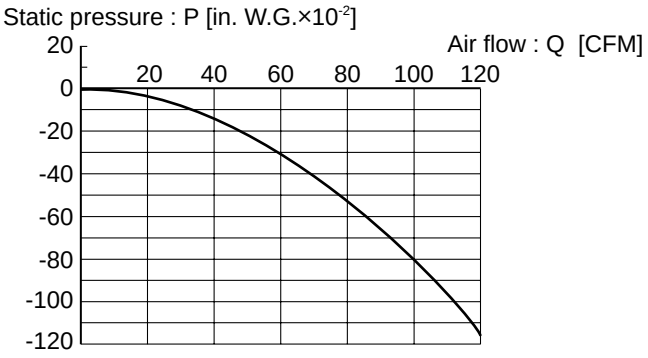
Fresh air intake hole diagram (Unit : inch)



5-2. FRESH AIR INTAKE AMOUNT & STATIC PRESSURE CHARACTERISTICS

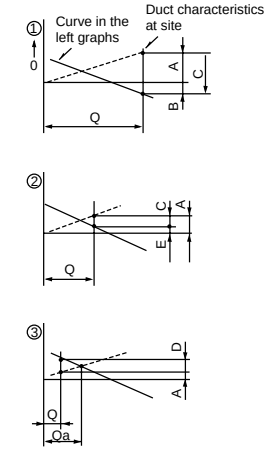
PLFY-P08NCMU-E(1).TH PLFY-P12NCMU-E(1).TH PLFY-P15NCMU-E(1).TH

Taking air into the unit



NOTE: Fresh air intake amount should be 20% or less of whole air amount to prevent dew dripping.

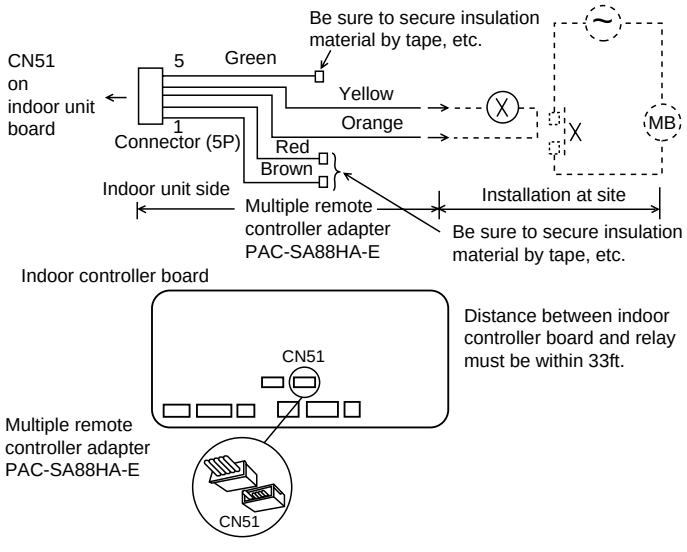
How to read curves



Q…Designed amount of fresh air intake <CFM>
A…Static pressure loss of fresh air intake duct system with air flow amount Q <in. W.G.×10-2>
B…Forced static pressure at air conditioner inlet with air flow amount Q <in. W.G.×10-2>
C…Static pressure of booster fan with air flow amount Q <in. W.G.×10-2>
D…Static pressure loss increase amount of fresh air intake duct system for air flow amount Q <in. W.G.×10-2>
E…Static pressure of indoor unit with air flow amount Q <in. W.G.×10-2>
Qa…Estimated amount of fresh air intake without D <CFM>

5-3. OPERATION IN CONJUNCTION WITH DUCT FAN (BOOSTER FAN)

• Whenever the indoor unit is operating, the duct fun also operates.
(1)Connect the optional multiple remote controller adapter(PAC-SA88HA-E) to the connector CN51 on the indoor controller board.
(2)Drive the relay after connecting the 12V DC relay between the Yellow and Orange connector wires.
(*)Use a relay of 1W or smaller.
MB: Electromagnetic switch power relay for duct fan.
X: Auxiliary relay (For DC 12V, coil rating : 1.0W or below)

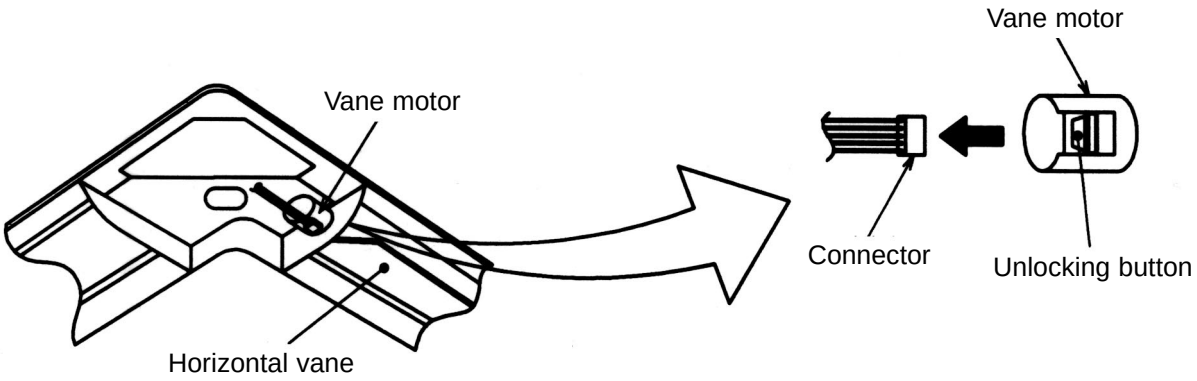


5-4. FIXING HORIZONTAL VANE

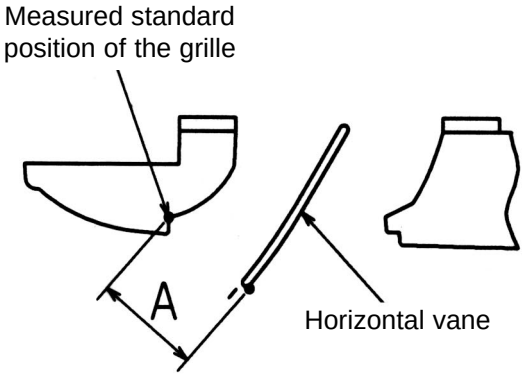
Horizontal vane of each air outlet can be fixed according to the environment where it is installed.

Setting procedure

1) Turn off a main power supply (Turn off a breaker).
2) Disconnect the vane motor connector of the direction of the arrow with pressing the unlocking button as shown in figure below.
   Insulate the disconnected connector with the plastic tape.



3) Set a vertical vane of the air outlet, which is to be fixed by the hand slowly within the range in the table below.



< Specified range >

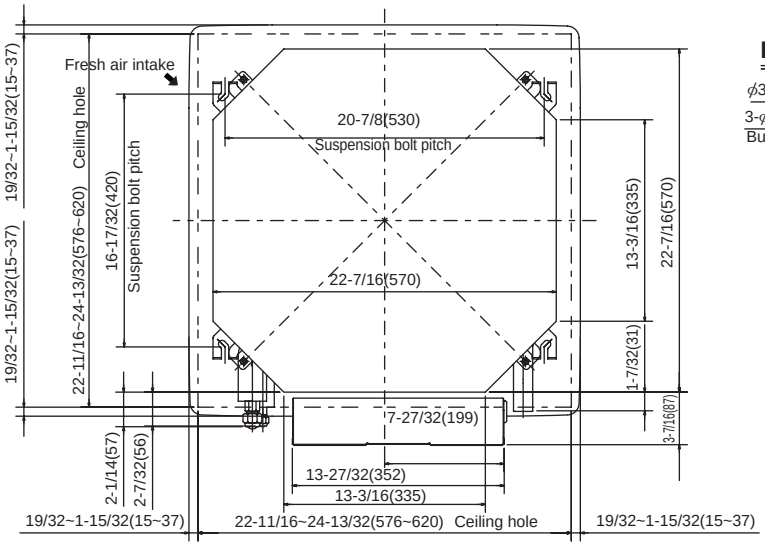
Up/down airflow direction	Horizontal 30°	Downward 45°	Downward 55°	Downward 70°
A	21 mm 13/16 inch	25 mm 31/32 inch	28 mm 1-3/32 inch	30 mm 1-3/16 inch

· The vanes can be set between 21mm, 13/16 inch and 30 mm, 1-3/16 inch.

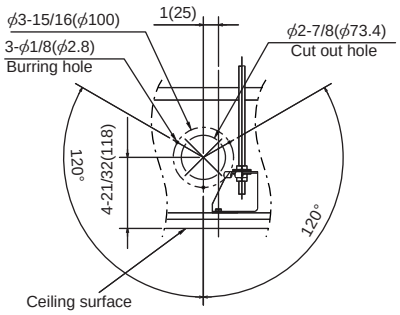
⚠ **Caution:**
Do not set the up/down vanes passed the specified range. Condensation could form and drop from the ceiling, or the unit could malfunction.

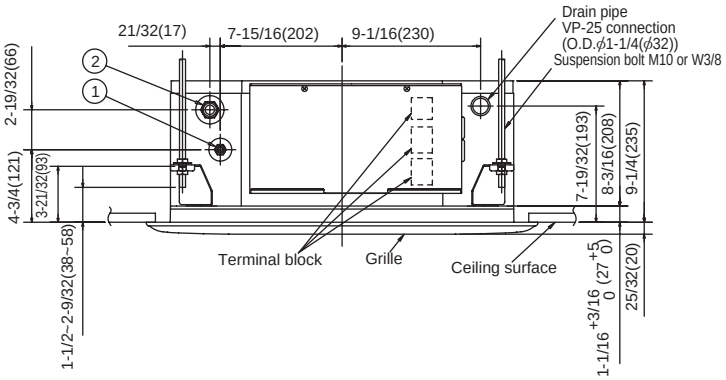
6 OUTLINES AND DIMENSIONS

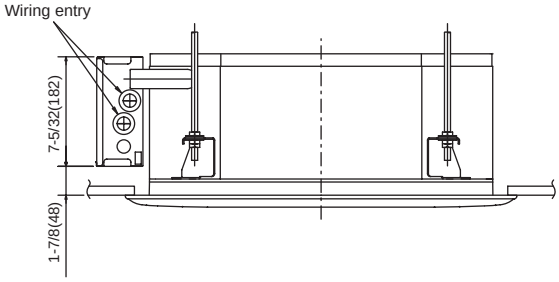
PLFY-P08NCMU-E.TH PLFY-P12NCMU-E.TH PLFY-P15NCMU-E.TH **Unit : inch(mm)**
PLFY-P08NCMU-E$_1$.TH PLFY-P12NCMU-E$_1$.TH PLFY-P15NCMU-E$_1$.TH



Detail drawing of fresh air intake



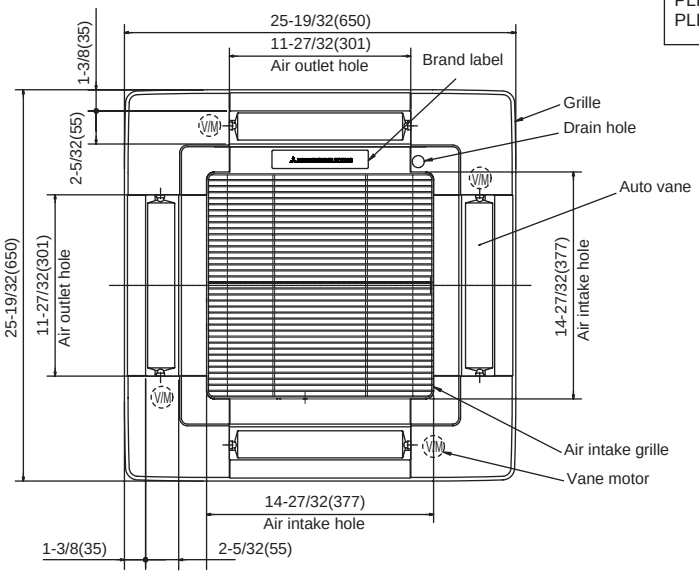




Unit : inch(mm)

Models	①	②
PLFY-P08NCMU-E$_{(1)}$.TH PLFY-P12NCMU-E$_{(1)}$.TH PLFY-P15NCMU-E$_{(1)}$.TH	Refrigerant pipe (1/4 (6.35) dia.) flared connection	Refrigerant pipe (1/2 (12.7) dia.) flared connection

Suspension bolt lower edge

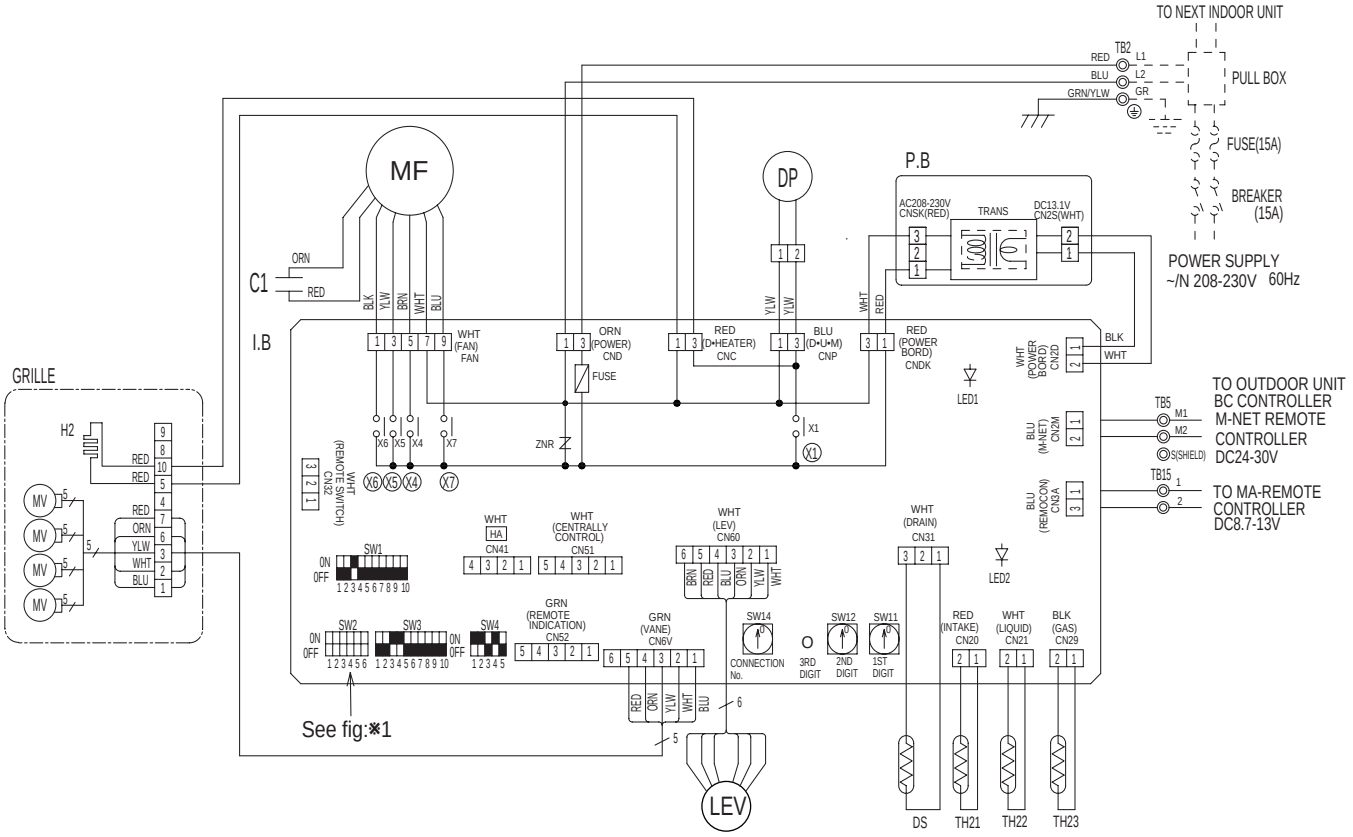


7 WIRING DIAGRAM

PLFY-P08NCMU-E.TH PLFY-P12NCMU-E.TH PLFY-P15NCMU-E.TH
PLFY-P08NCMU-E1.TH PLFY-P12NCMU-E1.TH PLFY-P15NCMU-E1.TH

[LEGEND]

SYMBOL	NAME		SYMBOL	NAME	
I.B	INDOOR CONTROLLER BOARD		C1	CAPACITOR (FAN MOTOR)	
CN32	CONNECTOR	REMOTE SWITCH	DP	DRAIN PUMP	
CN41		HA TERMINAL-A	DS	DRAIN SENSOR	
CN51		CENTRALLY CONTROL	H2	DEW PREVENTION HEATER	
CN52		REMOTE INDICATION	LEV	LINEAR EXPANSION VALVE	
FUSE	FUSE (6.3A/250V)		MF	FAN MOTOR (WITH THERMAL FUSE)	
SW1	SWITCH	MODE SELECTION	MV	VANE MOTOR	
SW2		CAPACITY CODE	TB2	TERMINAL BLOCK	POWER SUPPLY
SW3		MODE SELECTION	TB5		TRANSMISSION
SW4		MODEL SELECTION	TB15		MA-REMOTE CONTROLLER
SW11		ADDRESS SETTING 1ST DIGIT	TH21	THERMISTOR	ROOM TEMPERATURE DETECTION (32°F/15kΩ 77°F/5.4kΩ)
SW12		ADDRESS SETTING 2ND DIGIT			
SW14		CONNECTION No.	TH22		PIPE TEMPERATURE DETECTION/LIQUID (32°F/15kΩ 77°F/5.4kΩ)
X1	AUX. RELAY	DRAIN PUMP/DEW PREVENTION HEATER			
X4		FAN MOTOR (LL)	TH23		PIPE TEMPERATURE DETECTION/GAS (32°F/15kΩ 77°F/5.4kΩ)
X5		FAN MOTOR (Lo)			
X6		FAN MOTOR (Hi)	P.B	INDOOR POWER BOARD	
X7		FAN MOTOR (Me)			
ZNR	VARISTOR				



LED on indoor controller board for service

Mark	Meaning	Function
LED1	Main power supply	Main power supply(Indoor unit:208-230V) power on → Lamp is lit.
LED2	Power supply for MA-Remote controller	Power supply for MA-Remote controller on → Lamp is lit.

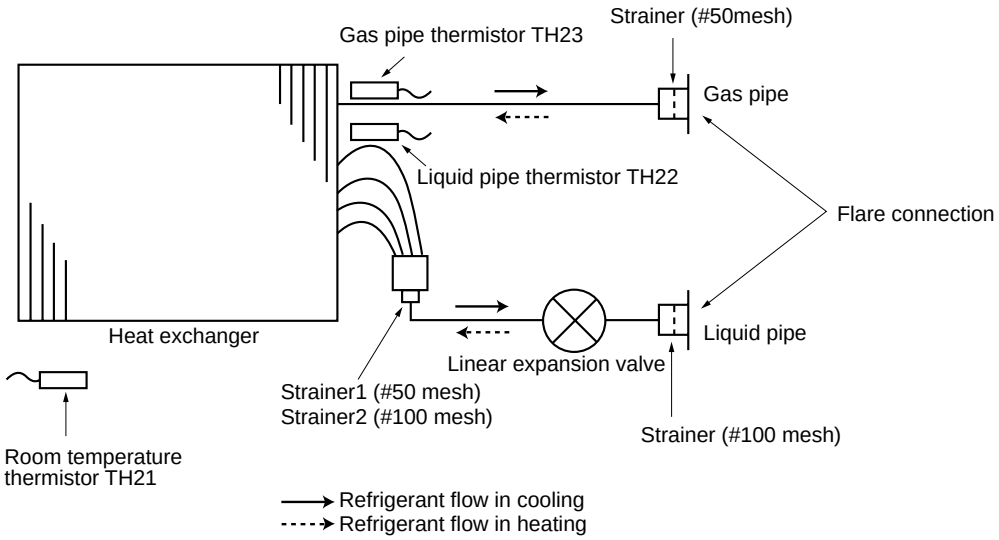
<fig:※1>

MODELS	SW2
P08	ON OFF 123456
P12	ON OFF 123456
P15	ON OFF 123456

Notes:
1.At servicing for outdoor unit, always follow the wiring diagram of outdoor unit.
2.In case of using MA-Remote controller, please connect to TB15. (Remote controller wire is non-polar.)
3.In case of using M-NET, please connect to TB5. (Transmisson wire is non-polar.)
4.Symbol[S] of TB5 is the shield wire connection.
5.Symbols used in wiring diagram above are, ◎ :terminal block, □□□ :connecter.
6.The setting of the SW2 dip switches differs in the capacity for the detail, refer to the fig:※1.
7.Use copper supply wire.

8 REFRIGERANT SYSTEM DIAGRAM

PLFY-P08NCMU-E.TH **PLFY-P12NCMU-E.TH** **PLFY-P15NCMU-E.TH**
PLFY-P08NCMU-E$_1$.TH **PLFY-P12NCMU-E$_1$.TH** **PLFY-P15NCMU-E$_1$.TH**

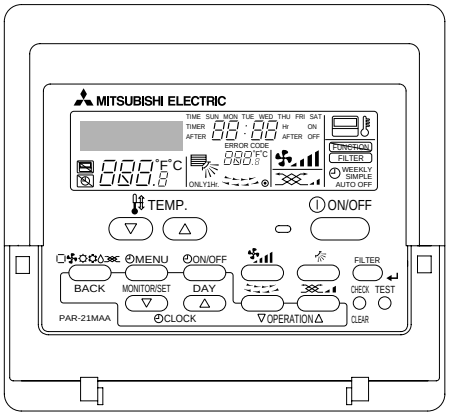


Unit : inch

Gas pipe	1/2
Liquid pipe	1/4

9 MICROPROCESSOR CONTROL

INDOOR UNIT CONTROL
9-1. COOL OPERATION



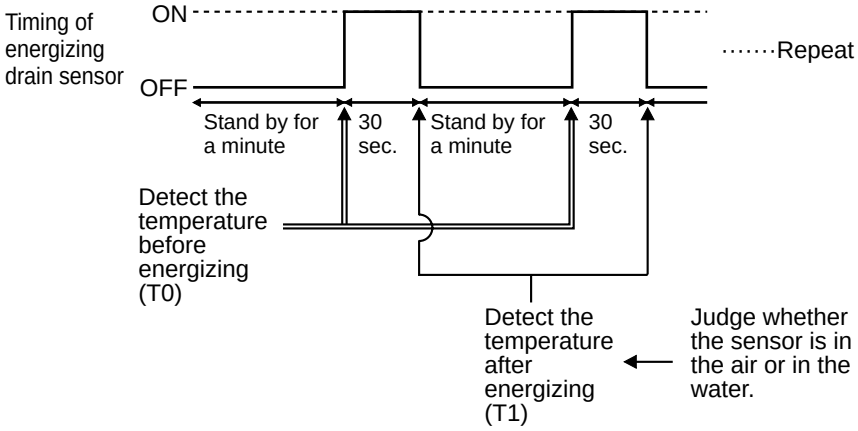
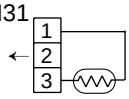
<How to operate>

① Press POWER ON/OFF button.
② Press the operation MODE button to display COOL.
③ Press the TEMP. button to set the desired temperature.
NOTE: The set temperature changes 1°F(2°F) when the ▽ or △ button is pressed once. Cooling 67 to 87°F
Variable range of the set temprature depends on the remote controller which is applied.

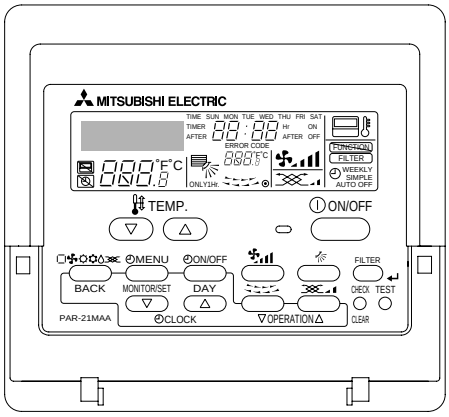
Control modes	Control details	Remarks
1. Thermoregulating function	1-1. Thermoregulating function (Function to prevent restarting for 3 minutes) • Room temperature ≧ desired temperature + 2°F ⋯Thermo ON • Room temperature ≦ desired temperature ⋯Thermo OFF	
	1-2. Anti-freezing control Detected condition : When the liquid pipe temp. (TH22) is 32°F or less in 16 minutes from compressor's start up, anti-freezing control starts and the thermo OFF. Released condition : The timer which prevents reactivating is set for 3 minutes, and anti-freezing control is cancelled when any one of the following conditions is satisfied. ① Liquid pipe temp. (TH22) turns 50°F or above. ② The condition of the thermo OFF has completed by thermoregulating, etc. ③ The operation modes became mode other than COOL. ④ The operation stopped.	
2. Fan	By the remote controller setting (switch of 3 speeds) Type: 3 speeds type — Fan speed notch: [Low], [Med], [High]	

Continued to the next page

From the preceding page

Control modes	Control details	Remarks
3. Drain pump	3-1. Drain pump control • Always drain pump ON during the COOL and DRY mode operation. (Regardless of the thermo ON/ OFF) • When the operation mode has changed from the COOL or DRY to the others (including Stop), OFF the control after the drain pump ON for 3 minutes.	
	Drain sensor function • Energize drain sensor at a fixed voltage for a fixed duration. After energizing, compare the drain sensor's temperature to the one before energizing, and judge whether the sensor is in the air or in the water. **Basic control system** • While drain pump is turned on, repeat the following control system and judge whether the sensor is in the air or in the water.  •Drain sensor temperature rise (Δt) •Temperature of drain sensor before current is applied (T_0) •Temperature of drain sensor after current is applied (T_1) [$\Delta t = T_1 - T_0$]	Drain sensor Indoor control P.C. board CN31 
4. Vane (up/ down vane change)	(1) Initial setting : Start at COOL mode and horizontal vane. (2) Vane position : Horizontal →Downward A →Downward B →Downward C→Swing (3) Restriction of the downward vane setting When setting the downward vane A, B or C in [Med] or [Low] of the fan speed notch, the vane changes to horizontal position after 1 hour.	"Only 1 Hr" appears on the wired remote controller.

9-2. DRY OPERATION

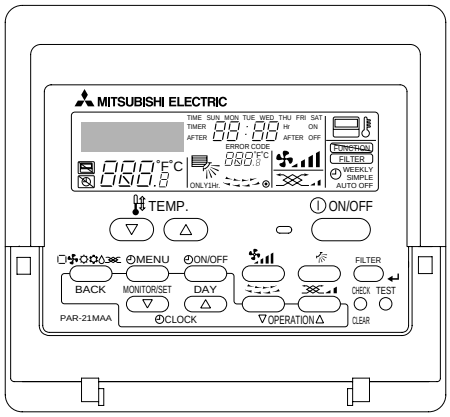


<How to operate>

① Press POWER ON/OFF button.
② Press the operation MODE button to display DRY.
③ Press the TEMP. button to set the desired temperature.
NOTE: The set temperature changes 1°F(2°F) when the ▽ or △ button is pressed once. Dry 67 to 87°F
Variable range of the set temprature depends on the remote controller which is applied.

<table>
<tr><th>Control modes</th><th>Control details</th><th>Remarks</th></tr>
<tr><td>1. Thermo regulating function</td><td>1-1. Thermo regulating function (Function to prevent restarting for 3 minutes)
Setting the Dry thermo by the thermo regulating signal and the room temperature (TH21).
Dry thermo ON Room temperature ≧ desired temperature + 2°F
Dry thermo OFF Room temperature ≦ desired temperature
<table>
<tr><th rowspan="2">Room temperature</th><th colspan="2">3 min. passed since starting operation</th><th rowspan="2">Dry thermo ON time (min)</th><th rowspan="2">Dry thermo OFF time (min)</th></tr>
<tr><th>Thermo regulating signal</th><th>Room temperature (T1)</th></tr>
<tr><td rowspan="5">Over 64°F</td><td rowspan="4">ON</td><td>T1 ≧ 83°F</td><td>9</td><td>3</td></tr>
<tr><td>83°F > T1 ≧ 79°F</td><td>7</td><td>3</td></tr>
<tr><td>79°F > T1 ≧ 75°F</td><td>5</td><td>3</td></tr>
<tr><td>75°F > T1</td><td>3</td><td>3</td></tr>
<tr><td>OFF</td><td>Unconditional</td><td>3</td><td>10</td></tr>
<tr><td>Less than 64°F</td><td colspan="4">Dry thermo OFF</td></tr>
</table>
1-2. Frozen prevention control
No control function</td><td></td></tr>
<tr><td>2. Fan</td><td>Indoor fan operation controll depends on the compressor conditions.
<table>
<tr><th>Dry thermo</th><th>Fan speed notch</th></tr>
<tr><td>ON</td><td>[Low]</td></tr>
<tr><td>OFF</td><td>Stop</td></tr>
</table>
Note: Remote controller setting is not acceptable.</td><td></td></tr>
<tr><td>3. Drain pump</td><td>Same control as COOL operation</td><td></td></tr>
<tr><td>4. Vane
(up/ down vane change)</td><td>Same control as COOL operation</td><td></td></tr>
</table>

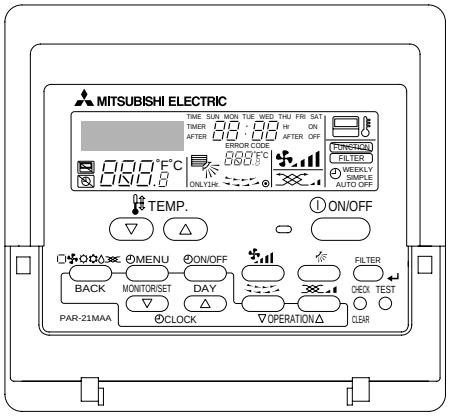
9-3. FAN OPERATION



<How to operate>
① Press POWER ON/OFF button.
② Press the operation MODE button to display FAN.

Control modes	Control details	Remarks
1. Fan	Set by remote controller. Type: 3 speeds type — Fan speed notch: [Low], [Med], [High]	
2. Drain pump	2-1. Drain pump control The drain pump turns ON for the specified amount of time when any of the following conditions is met: ① ON for 3 minutes after the operation mode is switched from COOL or DRY to another operation mode (FAN). ② ON for 6 minutes after the drain sensor is determined to be submerged using the liquid level detection method given below. ③ ON for 6 minutes after indoor piping (liquid piping) temperature – indoor intake temperature ≦ -18°F, AND the drain sensor input is at the short or open level. (If condition ② or ③ is still being met after the drain pump has been turned ON for 6 minutes, the drain pump is kept ON for further 6 minutes.)	
	2-2. Liquid level detection method The liquid level is detected by determining whether or not the drain sensor is submerged, based on the amount the temperature rises after self-heating the sensor. This process is performed if any of the following conditions is met: ① Drain pump is ON. ② Indoor piping (liquid piping) temperature – indoor intake temperature ≦ -18°F ③ Indoor piping (liquid piping) temperature or indoor intake temperature is at the short or open level temperature. ④ Every 1 hour after the drain pump has been switched from ON to OFF and 1 hour have passed.	
3. Vane (up/ down vane change)	Same as the control performed during the COOL operation, but no restriction on the vane's downward blow setting	

9-4. HEAT OPERATION



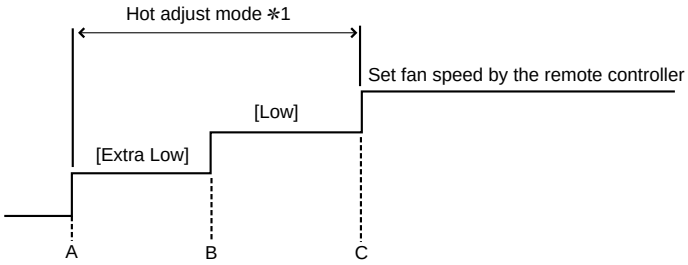
<How to operate>

① Press POWER ON/OFF button.
② Press the operation MODE button to display HEAT.
③ Press the TEMP. button to set the desired temperature.
NOTE: The set temperature changes 1°F(2°F) when the ▽ or △ button is pressed once. Heating 63 to 83°F
Variable range of the set temprature depends on the remote controller which is applied.

<Display in HEAT operation>

[DEFROST]
The [DEFROST] symbol is only displayed during the defrost operation.

[STANDBY]
The [STANDBY] symbol is only displayed during hot adjust mode.

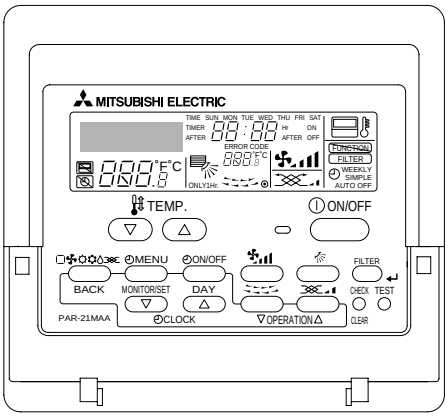
Control modes	Control details	Remarks
1. Thermoregulating function	1-1. Thermoregulating function (Function to prevent restarting for 3 minutes) • Room temperature ≦ desired temperature -2°F ⋯Thermo ON • Room temperature ≧ desired temperature ⋯Thermo OFF	
2. Fan	Controlled by the remote controller (3-speed) Give priority to controlled mode mentioned below. 2-1. Hot adjust mode 2-2. Preheating exclusion mode 2-3. Thermo OFF mode (When the compressor off by the thermoregulating) 2-4. Cool air prevention mode (Defrosting mode) 2-5. Capacity increasing mode	
	2-1. Hot adjust mode The fan controller becomes the hot adjust mode for the following conditions. ① When starting the HEAT operation ② When the thermoregulating function changes from OFF to ON. ③ When release the HEAT defrosting operation  A: Hot adjust mode start B: 5 minutes have passed since the condition A or the indoor liquid pipe temperature turned 95°F or more C: 2 minutes have passed since the condition A (Terminating the hot adjust mode)	∗1 "STAND BY" will be displayed during the hot adjust mode.
	2-2. Preheating exclusion mode When the condition changes the auxiliary heater ON to OFF (thermoregulating or operation stop, etc), the indoor fan operates in [Low] mode for 1 minute.	This control is same for the model without auxiliary heater.

Continued to the next page

From the preceding page

Control modes	Control details	Remarks
2. Fan	2-3. Thermo OFF mode When the thermoregulating function changes to OFF, the indoor fan operates in [Extra low].	
	2-4. Heat defrosting mode The indoor fan stops.	
3. Drain pump	No drain pump operation However, when the control changes from COOL or DRY operation, the drain pump operates for 3 minutes.	
4. Vane control (Up/ down vane change)	(1) Initial setting : OFF → HEAT⋯[last setting] When changing the mode from exception of HEAT to HEAT operation ⋯[Downward C] (2) Vane position : Horizontal →Downward A →Downward B →Downward C→Swing (3) Restriction of vane position ① The vane is horizontally fixed for the following modes. (The setting by the remote controller is temporarily invalidated and vane control is set by the unit controller.) • Thermo OFF • Hot adjust [Extra low] mode • Heat defrost mode	

9-5. AUTO OPERATION [AUTOMATIC COOL/HEAT CHANGE OVER OPERATION]



<How to operate>

① Press POWER ON/OFF button.

② Press the operation MODE button to display AUTO.

③ Press the TEMP. button to set the desired temperature.

NOTE: The set temperature changes 1°F(2°F) when the ▽ or △ button is pressed once. Automatic 67 to 83°F

Variable range of the set temprature depends on the remote controller which is applied.

"AUTO" works to change the operation mode either to cooling or heating according to the room temperature.

Control modes	Control details	Remarks
1. Initial value of operation mode	HEAT mode for room temperature < Desired temperature COOL mode for room temperature ≧ Desired temperature	
2. Mode change	(1) HEAT mode → COOL mode Room temperature ≧ Desired temperature + 3°F or 3 minutes has passed (2) COOL mode → HEAT mode Room temperature ≦ Desired temperature - 3°F or 3 minutes has passed	
3. COOL mode	Same control as cool operation	
4. HEAT mode	Same control as heat operation	

9-6. WHEN UNIT IS STOPPED CONTROL MODE

Control modes	Control details	Remarks
1. Drain pump	1-1. Drain pump control The drain pump turns ON for the specified amount of time when any of the following conditions is met (regardless of whether the compressor is ON or OFF) ① ON for 3 minutes after the operation mode is switched from COOL or DRY to another operation mode (HEAT mode). ② ON for 6 minutes after the drain sensor is determined to be submerged using the liquid level detection method given below. ③ ON for 6 minutes after indoor piping (liquid piping) temperature – indoor intake temperature ≦ 14°F, and the drain sensor input is at the short or open level. (If condition ② or ③ is still being met after the drain pump has been turned ON for 6 minutes, the drain pump is kept ON for a further 6 minutes.)	
	1-2. Liquid level detection method The liquid level is detected by determining whether or not the drain sensor is submerged, based on the amount the temperature rises after self-heating the sensor. This process is performed if any of the following conditions is met: ① Drain pump is ON. ② Indoor piping (liquid piping) temperature – indoor intake temperature ≦14°F (except during defrosting) ③ Indoor piping (liquid piping) temperature or indoor intake temperature is at the short or open level temperature. ④ Every 1 hour after the drain pump has been switched from ON to OFF.	

10 TROUBLESHOOTING

10-1. HOW TO CHECK THE PARTS

PLFY-P08NCMU-E.TH PLFY-P12NCMU-E.TH PLFY-P15NCMU-E.TH
PLFY-P08NCMU-E$_1$.TH PLFY-P12NCMU-E$_1$.TH PLFY-P15NCMU-E$_1$.TH

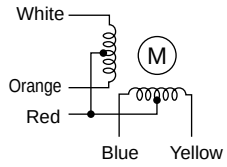
Thermistor (TH21) (Room temperature detection) Thermistor (TH22) (Pipe temperature detection/ Liquid) Thermistor (TH23) (Pipe temperature detection/ Gas)

Disconnect the connector then measure the resistance with a tester.
(At the ambient temperature 50°F~86°F)

Normal	Abnormal
4.3kΩ~9.6kΩ	Open or short

Refer to the next page for the details.

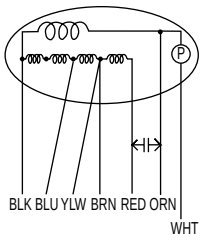
Vane motor (MV)



Measure the resistance between the terminals with a tester.
(At the ambient temperature 68°F~86°F)

Connector	Normal	Abnormal
Red — Yellow	300Ω	Open or short
Red — Blue		
Red — Orange		
Red — White		

Fan motor (MF)

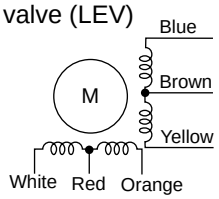


Ⓟ : Thermal fuse 284˚F±36°F

Measure the resistance between the terminals with a tester.
(Coil wiring temperature 50°F~86°F)

	Normal			Abnormal
	PLFY-P08NCMU-E$_{(1)}$	PLFY-P12NCMU-E$_{(1)}$	PLFY-P15NCMU-E$_{(1)}$	
WHT-BLK	387Ω~418Ω	303Ω~328Ω	272Ω~295Ω	Opened or short-circuited
BLK-BLU	77Ω~83Ω	105Ω~114Ω	79Ω~85Ω	
BLU-YLW	19Ω~21Ω	39Ω~42Ω	37Ω~40Ω	
YLW-RED RED-BRN	179Ω~193Ω	235Ω~254Ω	191Ω~206Ω	

Linear expansion valve (LEV)

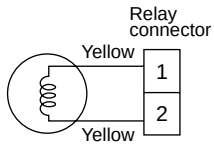


Disconnect the connector then measure the resistance valve with a tester.

Normal				Abnormal
White-Red	Yellow-Brown	Orange-Red	Blue-Brown	Open or short
150kΩ ±10%				

Refer to the next page for the details.

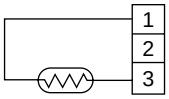
Drain pump (DP)



Measure the resistance between the terminals with a tester.
(At the ambient temperature 68°F~86°F)

Normal	Abnormal
290Ω	Open or short

Drain sensor (DS)



Measure the resistance after 3 minutes have passed since the power supply was intercepted.
(At the ambient temperature 32°F~140°F)

Normal	Abnormal
0.6kΩ~6.0kΩ	Open or short

Refer to the next page for the details.

<Thermistor characteristic graph>

Thermistor for lower temperature

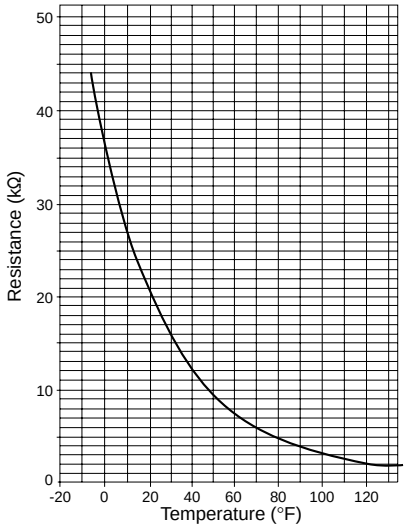
Room temperature thermistor(TH21)
Liquid pipe temperature thermistor(TH22)
Gas pipe temperature thermistor(TH23)

Thermistor R_0=15kΩ ± 3%
Fixed number of B=3480kΩ ± 2%

$$Rt=15\exp\{3480(\frac{1}{273+(t-32)/1.8}-\frac{1}{273})\}$$

30°F	15.8kΩ
50°F	9.6kΩ
70°F	6.0kΩ
80°F	4.8kΩ
90°F	3.9kΩ
100°F	3.2kΩ

< Thermistor for lower temperature >



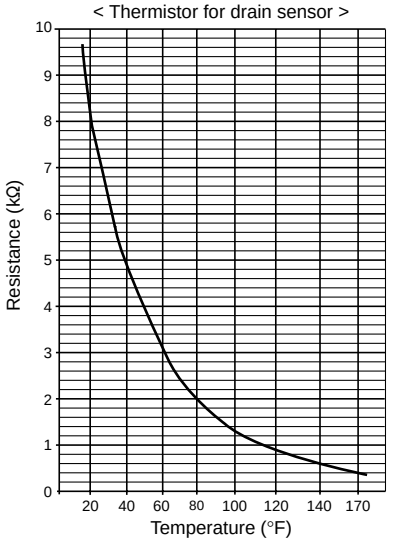
Thermistor for drain sensor

Thermistor R_0=6.0kΩ ±5%
Fixed number of B=3390kΩ ±2%

$$Rt=6\exp\{3390(\frac{1}{273+(t-32)/1.8}-\frac{1}{273})\}$$

30°F	6.3kΩ
50°F	3.9kΩ
70°F	2.5kΩ
80°F	2.0kΩ
90°F	1.6kΩ
100°F	1.3kΩ

< Thermistor for drain sensor >

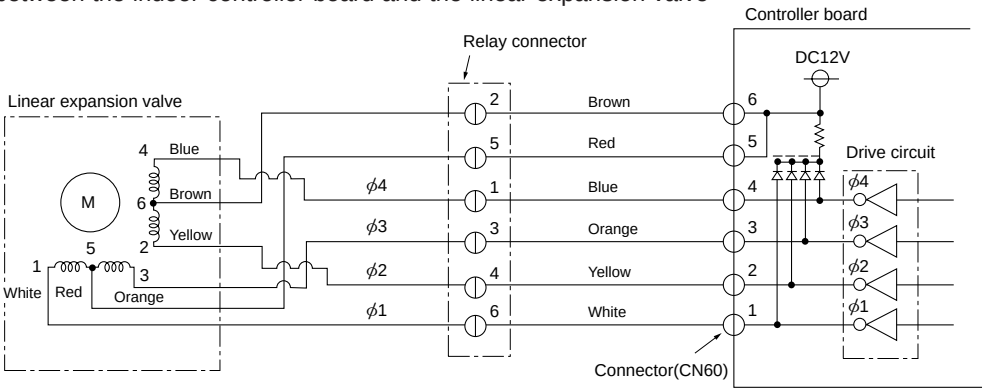


Linear expansion valve

① Operation summary of the linear expansion valve

• Linear expansion valve open/close through stepping motor after receiving the pulse signal from the indoor controller board.
• Valve position can be changed in proportion to the number of pulse signal.

<Connection between the indoor controller board and the linear expansion valve>



Note : Since the number of the connector at the controller board side and the relay connector are different, follow the color of the lead wire.

<Output pulse signal and the valve operation>

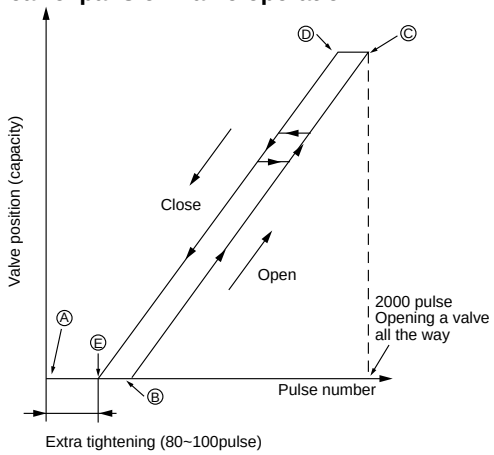
Output (Phase)	Output			
	1	2	3	4
ϕ1	ON	OFF	OFF	ON
ϕ2	ON	ON	OFF	OFF
ϕ3	OFF	ON	ON	OFF
ϕ4	OFF	OFF	ON	ON

Closing a valve : 1 → 2 → 3 → 4 → 1
Opening a valve : 4 → 3 → 2 → 1 → 4

The output pulse shifts in above order.

- When linear expansion valve operation stops, all output phases become OFF.
- At phase interruption or when phase does not shift in order, motor does not rotate smoothly and motor will lock and vibrate.

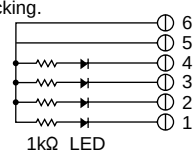
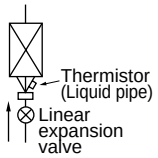
② Linear expansion valve operation



- When the switch is turned on, 2200 pulse closing valve signal will be send till it goes to Ⓐ point in order to define the valve position.

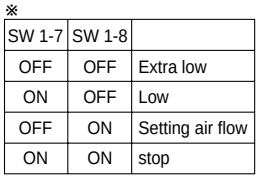
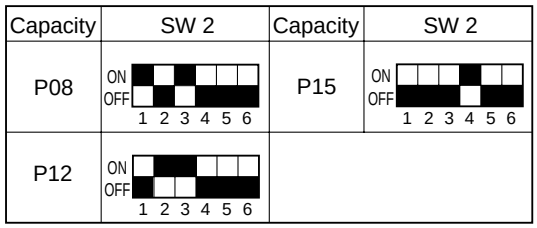
- When the valve moves smoothly, there is no sound or vibration occurring from the linear expansion valve : however, when the pulse number moves from Ⓔ to Ⓐ or when the valve is locked, more sound can be heard than normal situation.
- Sound can be detected by placing the ear against the screw driver handle while putting the screw driver to the linear expansion valve.

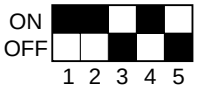
③ Troubleshooting

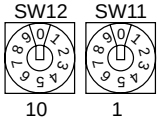
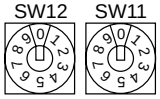
Symptom	Check points	Countermeasures
Operation circuit failure of the micro processor	Disconnect the connector on the controller board, then connect LED for checking.  Pulse signal will be sent out for 10 seconds as soon as the main switch is turned on. If there is LED with lights on or lights off, it means the operation circuit is abnormal.	Exchange the indoor controller board at drive circuit failure.
Linear expansion valve mechanism is locked.	Motor will idle and make ticking noise when motor is operated while the linear expansion valve is locked. This ticking sound is the sign of the abnormality.	Exchange the linear expansion valve.
Short or breakage of the motor coil of the linear expansion valve	Measure the resistance between the each coil (red-white, red-orange, brown-yellow, brown-blue) with a tester. It is normal if the resistance is in the range of 150Ω ± 10%	Exchange the linear expansion valve.
Valve doesn't close completely (thermistor leaking).	To check the linear expansion valve, operate the indoor unit in fan mode and at the same time operate other indoor units in cooling mode, then check the pipe temperature <liquid pipe temperature> of the indoor unit by the outdoor multi controller board operation monitor. During fan operation, linear expansion valve is closed completely and if there are some leaking, detecting temperature of the thermistor will go lower. If the detected temperature is much lower than the temperature indicated in the remote controller, it means the valve is not closed all the way. It is not necessary to exchange the linear expansion valve, if the leakage is small and not making any trouble.  	If a large amount of refrigerant is leaked, exchange the linear expansion valve.
Wrong connection of the connector or contact failure	Check the color of lead wire and missing terminal of the connector.	Disconnect the connector at the controller board, then check the continuity.

10-2. FUNCTION OF DIP SWITCH

<table>
<tr><th rowspan="2">Switch</th><th rowspan="2">Pole</th><th rowspan="2">Function</th><th colspan="2">Operation by switch</th><th rowspan="2">Effective timing</th><th rowspan="2">Remarks</th></tr>
<tr><th>ON</th><th>OFF</th></tr>
<tr><td rowspan="10">SW1
Function Selection</td><td>1</td><td>Thermistor <Room temperature detection> position</td><td>Built-in remote controller</td><td>Indoor unit</td><td rowspan="10">Under suspension</td><td rowspan="10">Indoor controller board
<Initial setting>

※
 
</td></tr>
<tr><td>2</td><td>Filter clogging detection</td><td>Provided</td><td>Not provided</td></tr>
<tr><td>3</td><td>Filter cleaning</td><td>2,500h</td><td>100h</td></tr>
<tr><td>4</td><td>Fresh air intake</td><td>Effective</td><td>Not effective</td></tr>
<tr><td>5</td><td>Remote indication switching</td><td>Thermo ON signal indication</td><td>Fan output indication</td></tr>
<tr><td>6</td><td>Humidifier control</td><td>Fan operation at Heating mode</td><td>Thermo ON operation at heating mode</td></tr>
<tr><td>7</td><td rowspan="2">Air flow set in case of Heat thermo OFF</td><td>Low ※</td><td>Extra low ※</td></tr>
<tr><td>8</td><td>Setting air flow ※</td><td>Depends on SW1-7</td></tr>
<tr><td>9</td><td>Auto restart function</td><td>Effective</td><td>Not effective</td></tr>
<tr><td>10</td><td>Power ON/OFF</td><td>Effective</td><td>Not effective</td></tr>
<tr><td>SW2
Capacity code setting</td><td>1~6</td><td colspan="3"> 
</td><td>Before power supply ON</td><td>Indoor controller board
<Initial setting>
Set for each capacity.</td></tr>
<tr><td rowspan="10">SW3
Function setting</td><td>1</td><td>Heat pump / Cooling only</td><td>Cooling only</td><td>Heat pump</td><td rowspan="10">Under suspension</td><td rowspan="10">Indoor controller board
Set while the unit is off.
<Initial setting>

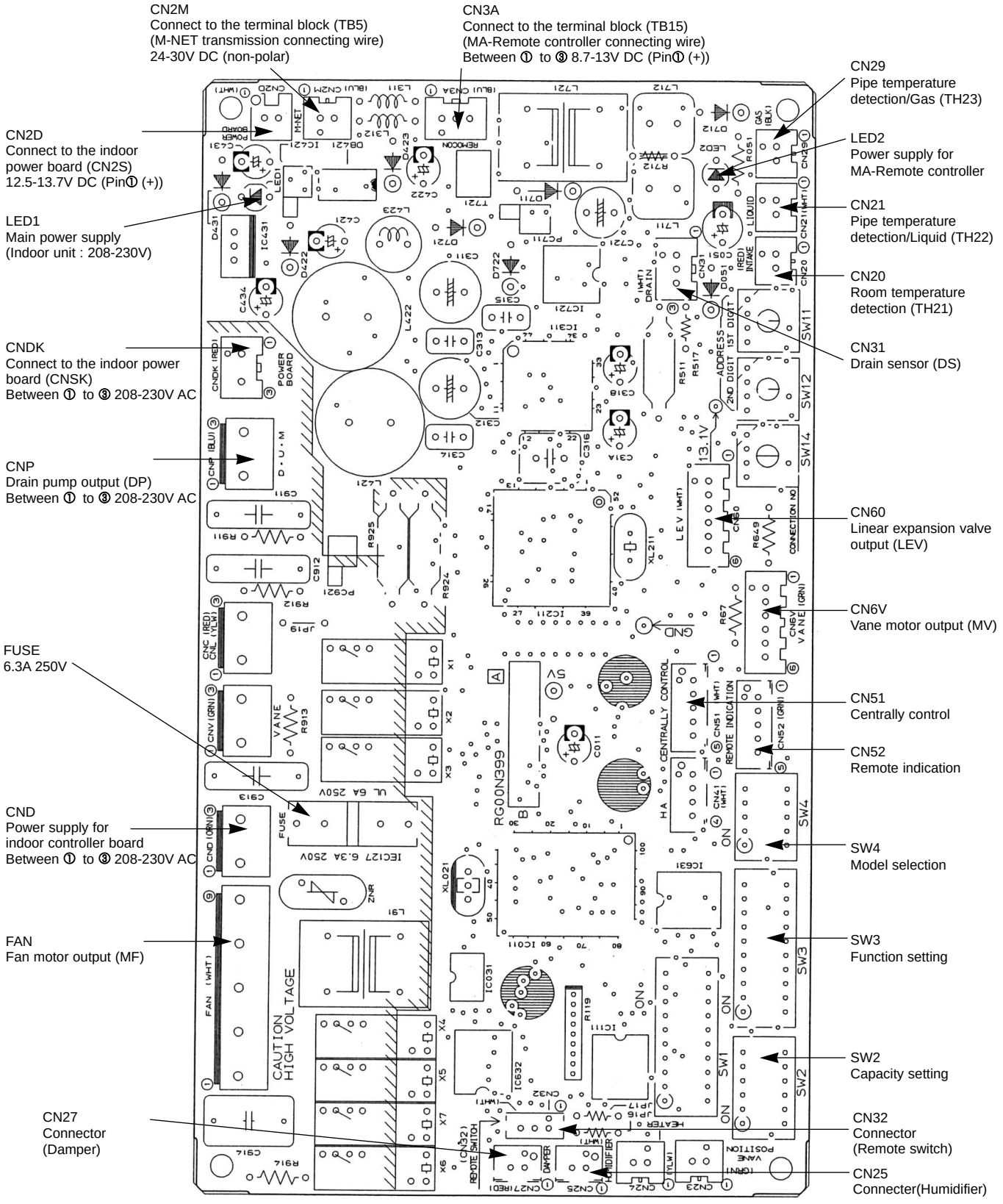
Note :
※4 At cooling mode, each angle can be used only 1 hour.
※5 Do not use SW3-9, 10 as trouble might be caused by the usage condition.
※6 Second setting is same as first setting</td></tr>
<tr><td>2</td><td>Louver</td><td>Available</td><td>Not available</td></tr>
<tr><td>3</td><td>Vane</td><td>Available</td><td>Not available</td></tr>
<tr><td>4</td><td>Vane swing function</td><td>Available</td><td>Not available</td></tr>
<tr><td>5</td><td>Vane horizontal angle</td><td>Second setting ※6</td><td>First setting</td></tr>
<tr><td>6</td><td>Vane cooling limit angle setting ※4</td><td>Horizontal angle</td><td>Down B, C</td></tr>
<tr><td>7</td><td>Indoor linear expansion valve opening</td><td>Effective</td><td>Not effective</td></tr>
<tr><td>8</td><td>Heat 4degrees up</td><td>Not effective</td><td>Effective</td></tr>
<tr><td>9</td><td>Superheat setting temperature ※5</td><td>—</td><td>—</td></tr>
<tr><td>10</td><td>Sub cool setting temperature ※5</td><td>—</td><td>—</td></tr>
<tr><td>SW4
Unit Selection</td><td>1~5</td><td colspan="3">In case of replacing the indoor controller board, make sure to set the switch to the initial setting, which is shown below.
 
</td><td>Before power supply ON</td><td>Indoor controller board</td></tr>
</table>

	Pole	Operation by switch	Effective timing	Remarks
SW11 1st digit address setting SW12 2nd digit address setting	Rotary switch	 Address setting should be done when M-NET remote controller is being used.	Before power supply ON	Indoor controller board <Initial setting> 
SW14 Connection No. setting	Rotary switch	 This is the switch to be used when the indoor unit is operated with R2 series outdoor unit as a set.		Indoor controller board <Initial setting>

10-3. TEST POINT DIAGRAM

10-3-1. Indoor controller board

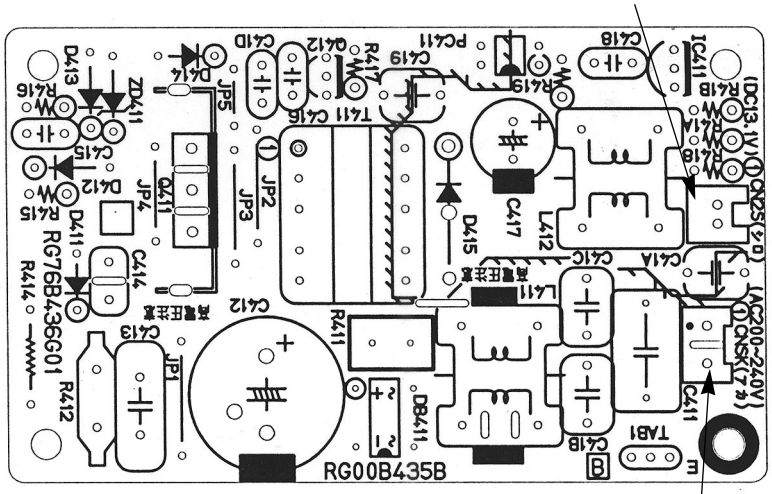
PLFY-P08NCMU-E.TH PLFY-P12NCMU-E.TH PLFY-P15NCMU-E.TH
PLFY-P08NCMU-E1.TH PLFY-P12NCMU-E1.TH PLFY-P15NCMU-E1.TH



10-3-2. Indoor power board

PLFY-P08NCMU-E.TH PLFY-P12NCMU-E.TH PLFY-P15NCMU-E.TH
PLFY-P08NCMU-E1.TH PLFY-P12NCMU-E1.TH PLFY-P15NCMU-E1.TH

CN2S
Connect to the indoor controller board (CN2D)
Between ① to ③ 12.6-13.7V DC (Pin① (+))

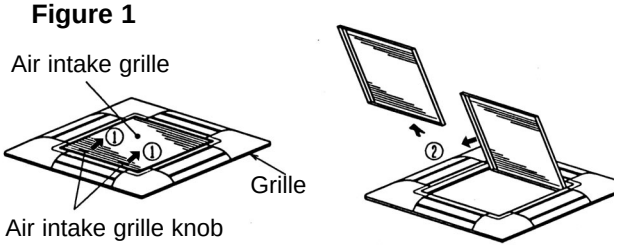
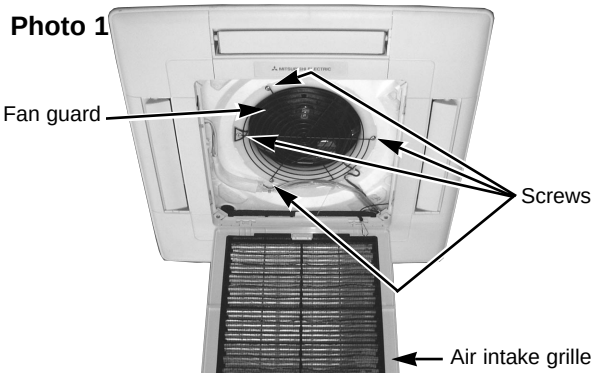
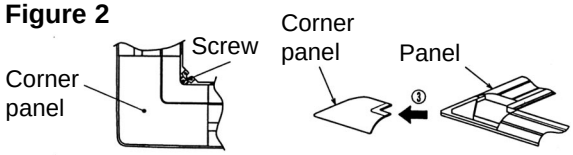
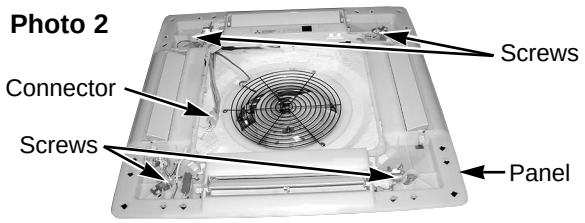
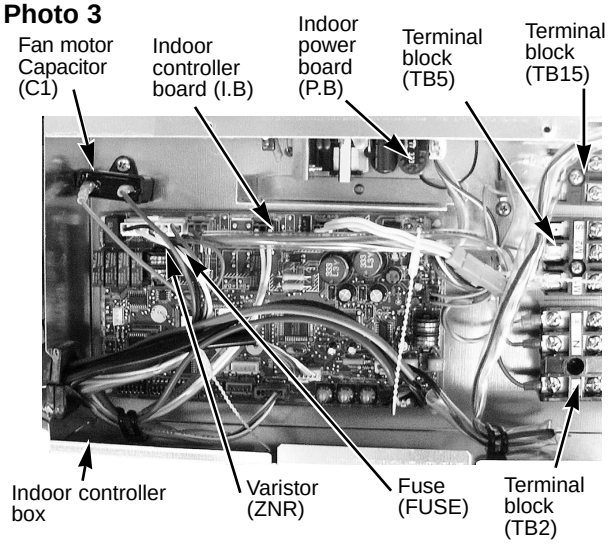


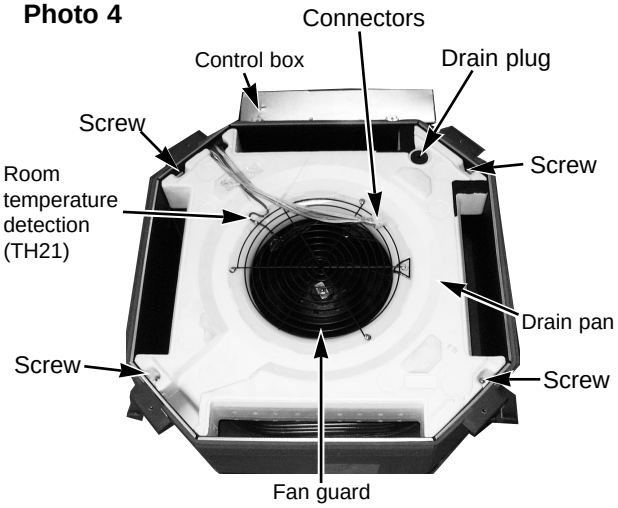
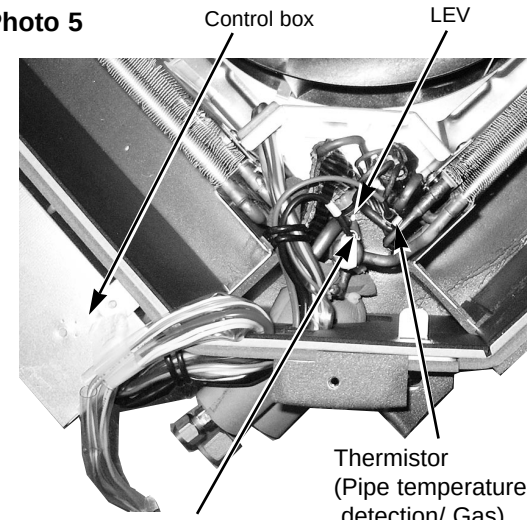
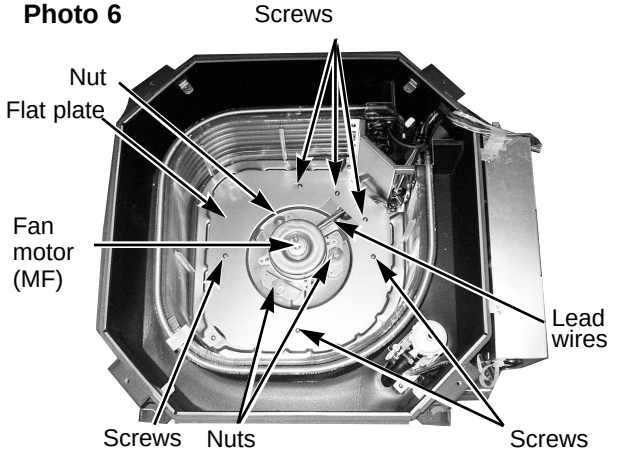
CNSK
Connect to the indoor controller board (CNDK)
Between ① to ③ 208-230V AC

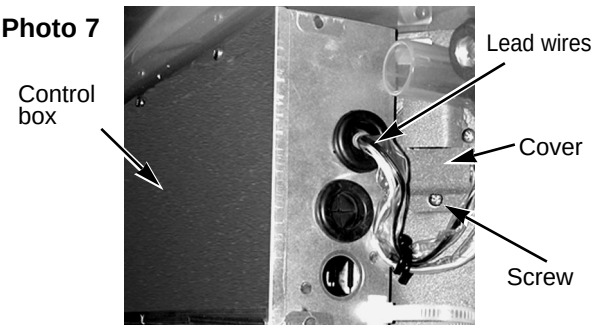
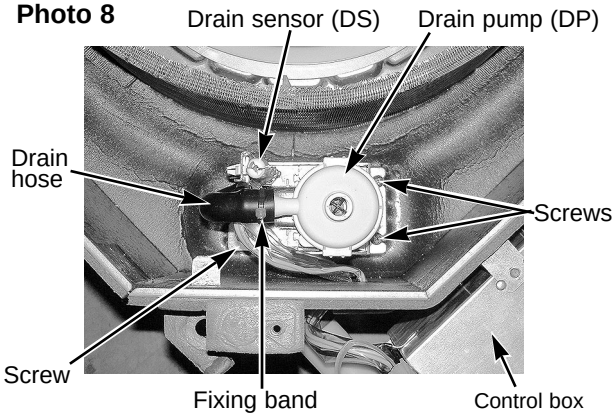
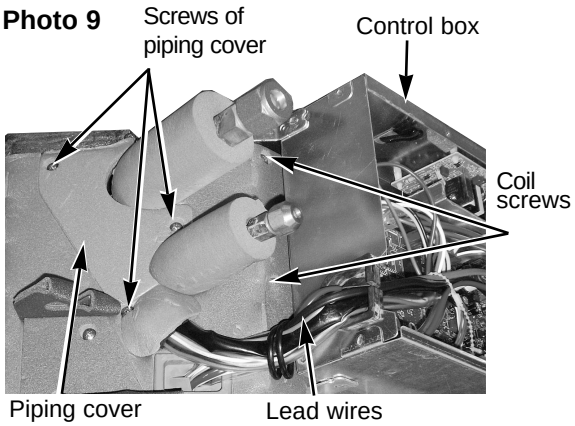
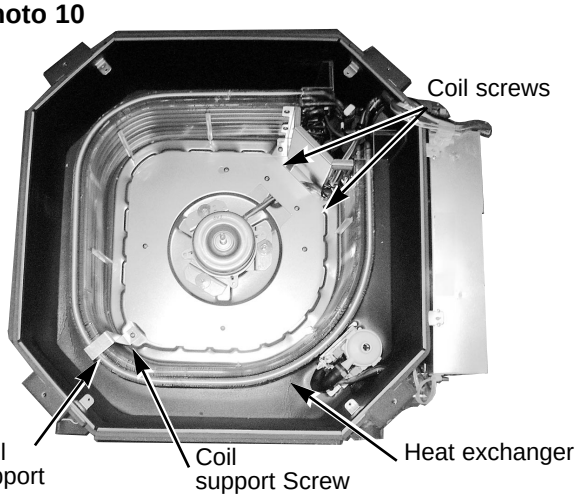
11 DISASSEMBLY PROCEDURE

PLFY-P08/12/15NCMU-E.TH PLFY-P08/12/15NCMU-E$_1$.TH

Be careful on removing heavy parts.

OPERATING PROCEDURE	PHOTOS&ILLUSTRATIONS
1. Removing the air intake grille (1) Slide the knob of air intake grille to the direction of the arrow ① to open the air intake grille. (2) Remove the string hook from the panel to prevent the grille from dropping. (3) Slide the hinge of the intake grille to the direction of the arrow ② and remove the air intake grille.	**Figure 1** 
2. Removing the fan guard (1) Open the air intake grille. (2) Remove the 3 screws of fan guard.	**Photo 1** 
3. Removing the panel (1) Remove the air intake grille. (Refer to **1**) **Corner panel (See figure 2)** (1) Remove the screw of the corner. (2) Slide the corner panel to the direction of the arrow ③, and remove the corner panel. **Panel (See photo 2)** (1) Disconnect the connector that connects with the unit. (2) Remove the 2 screws from the panel and loose other 2 screws, which are fixed to the oval hole, have different diameter. (3) Rotate the panel a little to remove the screws.(Slide the panel so that the screw comes to a larger diameter of the oval hole, which has two different diameters.)	**Figure 2**  **Photo 2** 
4. Removing the electrical parts (1) Remove the 2 screws and the control box cover. <Electrical parts in the control box> • Indoor controller board (I.B) • Indoor power board (P.B) • Fan motor capacitor (C1) • Fuse (FUSE) • Varistor (ZNR) • Terminal block (TB)	**Photo 3** 

OPERATING PROCEDURE	PHOTOS&ILLUSTRATIONS
5. Removing the room temperature detection (TH21) (1) Remove the panel. (Refer to **3**) (2) Pull out the room temperature detection from the drain pan. (3) Remove the 2 screws fixed to the control box cover, and remove the control box cover. (4) Remove the connector (CN20) from the indoor controller board, and disconnect the room temperature detection.	**Photo 4** 
6. Removing the drain pan (1) Remove the panel. (Refer to **3**) (2) Remove the room temperature detection and the 2 lead wires held with fastener; wireless controller board relay connector (9P red) and panel relay connector (10P white). (3) Remove the 4 screws fixed to the drain pan, and remove the drain pan. (4) Remove the fan guard. (Refer to **2**)	
7. Removing the pipe temperature detection/liquid (TH22) and pipe temperature detection/gas (TH23) (1) Remove the panel. (Refer to **3**) (2) Remove the drain pan. (Refer to **6**) (3) Disconnect the liquid or gas from the holder. (4) Remove the 3 screws fixed to the piping cover, and remove the piping cover. (See photo 9) (5) Remove the 2 screws fixed to the control box cover, and remove the control box cover. **Pipe temperature detection/liquid (TH22)** (6) Remove the connector (CN21) from the indoor controller board, and disconnect the pipe temperature detection/Liquid. **Pipe temperature detection/gas (TH23)** (6) Remove the connector (CN29) from the indoor controller board, and disconnect the pipe temperature detection/Gas with its holder.	**Photo 5** 
8. Removing the fan motor (MF) (1) Remove the panel. (Refer to **3**) (2) Remove the drain pan. (Refer to **6**) (3) Remove the nut and the washer from the turbo fan, and remove the turbo fan. (4) Remove the 2 screws fixed to the control box cover, and remove the control box cover. (5) Disconnect the connectors of the (FAN) from the indoor controller board. (6) Remove the 3 screws fixed to the piping cover, and remove the piping cover. (See photo 9) (7) Remove the 6 screws fixed to the flat plate, and remove the flat plate. (8) Disconnect the lead wires to the direction of the fan motor, and remove 3 nuts of the fan motor.	**Photo 6** 

OPERATING PROCEDURE	PHOTOS&ILLUSTRATIONS
9. Removing the drain pump (DP) and drain sensor (DS) (1) Remove the panel. (Refer to **3**) (2) Remove the drain pan. (Refer to **6**) (3) Remove the 2 screws fixed to the control box cover, and remove the control box cover. (4) Remove the connectors of the (CNP) and the (CN31) from the indoor controller board. (5) Remove the 1 screw fixed to the cover, and remove the cover.(See photo 7) (6) Disconnect the lead wires to the direction of the drain pump. (7) Remove the 3 screws of the drain pump.(See photo 8) (8) Cut the drain hose fixing band, pull out the drain hose from the drain pump. (9) Pull out the drain pump. (10) Remove the drain sensor and the holder.	**Photo 7**  **Photo 8** 
10. Removing the heat exchanger (1) Remove the panel. (Refer to **3**) (2) Remove the drain pan. (Refer to **6**) (3) Remove the nut and the washer from the turbo fan, and remove the turbo fan. (4) Remove the 2 screws fixed to the control box cover, and remove the control box cover. (5) Disconnect the connectors of the (FAN) from the indoor controller board. (6) Remove the 3 screws fixed to the piping cover, and remove the piping cover. (See photo 9) (7) Remove the pipe temperature thermistor/liquid and condenser/evaporator temperature thermistor. (Refer to **7**) (8) Disconnect the lead wires to the direction of the fan motor. (9) Remove 1 coil support screw, 2 inside coil screws (See photo 10), and 4 outside coil screws (See photo 9) from the heat exchanger, and remove the heat exchanger.	**Photo 9**  **Photo 10** 

CITY MULTI

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